Module 5

Troubleshooting

5.1 OBJECTIVES

Students will be able to:

- Understand basic troubleshooting steps
- Identify hardware and software troubleshooting tools
- Identify hardware, software and network conflicts
- Understand interrupt conflicts
- Understand direct memory addressing

5.2 OVERVIEW

Troubleshooting hardware and software can be the biggest challenge a work group manager will come across. But remember that troubleshooting is just another word for problem solving. Problem solving is just a systematical approach to evaluating a problem and coming up with a resolution to solve the problem.

In this module, we will discuss some basic systematical approaches to use when troubleshooting hardware and software problems. We will continue to discuss different tools and resources that you will use in the troubleshooting process as well as where to find help when troubleshooting.

5.3 THE ART OF TROUBLESHOOTING

5.3.1 BASIC TROUBLESHOOTING SKILLS

First organize all of your available tools. This is the biggest barrier when troubleshooting not having the necessary tool available when you need them.

5.3.2 VENDOR GUIDES

The following is a brief listing of PC hardware vendors, software vendors, and other resources and their Internet URLs:

www.mircosoft.com	Microsoft Corporation
www.intel.com	Intel Corporation
www.mot.com	Motorola Corporation
www.ibm.com	IBM Corporation
www.compaq	Compaq Computer Corporation
www.hp.com	Hewlett-Packard Corporation
www.3com.com	3Com/U.S. Robotics
www.zdnet.com	Ziff-Davis Publishing
www.dejanews.com/usenet	Usenet news archive
www.bootdisk.com	Boot disk site
www.download.com	Driver site

5.3.3 TOOLS

Ensure you have the proper tools, both hardware and software. Software tools will be necessary for reconfiguring system files that are corrupted. Hardware tools are necessary when you physically open the computer.

5.4 TROUBLESHOOTING SYSTEMATICAL APPROACH

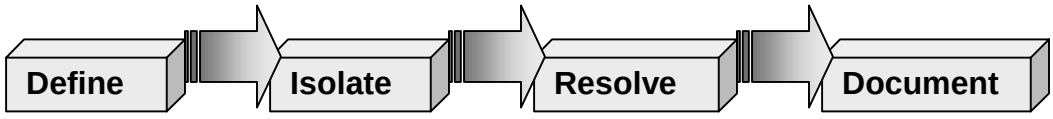
While troubleshooting can sometimes be frustrating and overwhelming there are some basic steps:

- Define the problem: Determine if it is a network, software or hardware problem. More than 80% of problems are software and hardware problem.

- Isolate the occurrence: Now that you have determined if it is a network, software or hardware problem re-create the problem to determine if there is a quick fix. When re-creating the problem, document the type of problem and conditions that are present.

- Fix the problems: Now that you know what the problem is, fix it. Refer to technical documentation and to Internet resources to resolve the problem. Check the vendor web site to see if this problem has occurred before. More than 50% of the time the problem has been documented at the vendor web site and solution documentation can be downloaded.

- Document: Now that you have solved the problem it is vital that you document it for future use. More than likely the same problem will occur on other like systems. Documentation will save repeated research of the same problem in the future



5.5 TROUBLESHOOTING TOOLS

5.5.1 TRADITIONAL HARDWARE TROUBLESHOOTING TOOLS

- Screwdrivers

- Both straight-tip and cross-tip screwdrivers will be required to open systems, removing and replacing boards, and attaching cables.

- Standard Pliers

- Long-nose Pliers

- Nut drivers

- Tweezers (Used to pick-up small objects)
- Torx Drivers
- Chip Pullers (Used for removing RAM chips)
- Flashlight
- Multimeter or Volt-Ohm-Milliammeter (VOM) (Used to check power supplies)

5.5.2 TRADITIONAL SOFTWARE TROUBLESHOOTING TOOLS

- Copy of applications software
- Copy of component drivers
- Copy of all application service patches
- Partition Magic (Third party software used to partition drives)
- Ghost or Image cast (Third party software used for system recovery)

5.6 BIOS BEEPS

Your computer has a way of communicating with you when it is booting up or being turned on. If it finds something wrong before it gets around to testing the video card, it cannot flash an error message on the screen. Therefore, the computer beeps to indicate what is wrong. Unfortunately, there are no clearly defined existing "beep standards." All PC manufacturers know their computers should beep when something is wrong, but because there are not any hard and fast rules to follow, the manufacturer assigns different beep codes to different problems.

The beep codes are stored in your computer's BIOS chip. By figuring out what BIOS your computer uses, you can tell which beep codes your computer uses. Watch the screen carefully when your computer first boots up or is turned on. You will see a company name (probably AMI, short for American Mega trends, or Phoenix). These two companies are the biggest BIOS makers. Do not be confused by the video card BIOS copyright stuff that may pop up on the first line.

When your computer makes some beeps and stops working, count the number of beeps you hear. Feel free to turn the computer off, wait 30 seconds, and turn it back on again. You will need to refer to a maintenance book in order to translate the number of beeps into usable information.

As an example we have included the chart Table 5-1 for the Phoenix BIOS:

1 -1 – 3	Your computer can't read its CMOS, so your motherboard is complaining
1 - 1 – 4	Your BIOS probably needs to be replaced
1 - 2 – 1	A timer chip on your motherboard is acting up; you'll probably have to replace the motherboard
1 - 2 – 2	The motherboard is bad
1 - 2 – 3	You have a bad motherboard or memory
1 - 3 – 1	The motherboard or memory is bad
1 - 3 – 3	The motherboard or memory is bad
1 - 3 – 4	You probably have a bad motherboard
1 - 4 – 1	You probably have a bad motherboard
1 - 4 - 2	Some of the memory is bad

Table 5-1. Phoenix Beep Codes

5.7 LOADING THE OPERATING SYSTEM

- The system should now be ready for loading the operating system. In this section, we will see what is involved with loading the operating system. Every different operating system will load in different ways. Here, we use DOS as an example. The process goes like this:

- Scan drive A: then C: to find a drive that is ready. The order can be changed in the CMOS.

- If reading from the C: drive, load the Master Boot Record (MBR); otherwise, skip to the DOS Boot Record.

- Execute the program in the MBR and find the bootable partition in MBR.

- Load DOS Boot Record (DBR), the first sector in the DOS partition or the first sector on a DOS-bootable floppy.

- Pass control to DBR.

- DBR directs loading the "hidden files" (IO.SYS or IBMBIO.COM, MSDOS.SYS or IBMDOS.COM) which comprise most of DOS.

- The first hidden file (IO.SYS or IBMBIO.COM) reloads the other hidden files.

- The first hidden file loads and interprets CONFIG.SYS, including device drivers.

- Unless directed otherwise by the SHELL statement, DOS loads the command shell COMMAND.COM from the C: \ drive and directory.

- COMMAND.COM loads and executes AUTOEXEC.BAT.

At this point, you should receive dialog from the CPU if it should encounter any errors. Each error message should give you some indication of what went wrong and what to do to correct it. Probably the most common error is a bad or missing command. Check the path to ensure it has not been deleted. If the system had been operating properly in the past, attempt to determine the last changes made. This is a lot harder to determine than you might think. If you ask any operator what they did last, the number one answer is "nothing."

5.8 TROUBLESHOOTING SOFTWARE

The hardest part of troubleshooting is determining whether the problem is hardware or software. The following are ways to determine whether you have a hardware or software problem:

1. Is the problem limited to one system?

Answer: If the problem is only occurring on one system then it is most likely a hardware problem.

2. Is the problem common to all of your systems?

Answer: If the problem is occurring on all systems then it is most likely a network software problem.

3. Has the application or operating system been recently upgraded?

Answer: If you have added application or upgraded software then you have a software conflict.

4. Have you recently made any hardware changes?

Answer: While this would imply the problem is hardware related, it may be that there is a software problem that only appears on certain hardware configurations.

5.9 TROUBLESHOOTING

5.9.1 CONFLICT TROUBLESHOOTING

The incredible acceptance and popularity of the PC largely results from the use of an “open architecture.” An open architecture allows any manufacturer to develop new devices (e.g., video boards, modems, soundboards, etc.) that will work in conjunction with the PC. When a new expansion board is added to the PC, the board uses various system resources in order to obtain CPU time and transfer data across the expansion bus. Ultimately, each board that is added to the system requires unique resources. No two devices can use the same resources—otherwise, a hardware conflict will result. Low-level software (such as device drivers and Terminate and Stay Resident applications (TSRs)) that uses system resources can also conflict with one another during normal operation.

5.9.2 UNDERSTANDING SYSTEM RESOURCES

The key to understanding and eliminating conflicts is to understand the importance of each system resource that is available to you. PCs provide three types of resources: interrupts, DMA channels, and I/O areas. Many controllers and network devices also utilize BIOS, which requires memory space. Do not underestimate the importance of these areas—conflicts can occur anywhere, and carry dire consequences for a system.

5.9.3 INTERRUPTS

An interrupt is probably the most well-known and understood type of resource. Interrupts are used to demand attention from the CPU. This allows a device or sub-system to work in the background until a particular event occurs that requires system processing. Such an event might include receiving a character at the serial port, striking a key on the keyboard, or any number of other real-world situations. An interrupt is invoked by asserting a logic level on one of the physical interrupt request (IRQ) lines that are accessible through any of the motherboard's expansion bus slots. AT-compatible PCs provide 16 IRQ lines (noted IRQ 0 to IRQ 15). Table 5-2 illustrates the IRQ assignments for current AT systems. These lines run from pins on the expansion bus connector or key ICs on the motherboard to Programmable Interrupt Controllers (PICs) on the motherboard. The output signal generated by a PIC triggers the CPU interrupt. Keep in mind Table 5-2 covers hardware interrupts only. There are also a proliferation of processor and software-generated interrupts.

IRQ	FUNCTION
0	Keyboard-controller IC
1	Keyboard-controller IC
2	Second IRQ controller IC
3	Serial port 2 (COM2: 2F8h–2FFh and COM4: 2E8h–2EFh)
4	Serial port 1 (COM1: 3F8h–3FFh and COM3: 3E8h–3EFh)
5	Parallel port 2 (LPT2: 378h or 278h)
6	Floppy-disk controller
7	Parallel port 1 (LPT1: 3BCh [mono] or 378h [color])
8	Real-time clock (RTC)
9	Unused (redirected to IRQ 2)
10	USB (on systems so equipped—can be disabled)
11	Windows sound system (on systems so equipped—can be disabled)
12	Motherboard mouse port (PS/2 port)
13	Math co-processor
14	Primary AT/IDE hard-disk controller
15	Secondary AT/IDE hard-disk controller (on systems so equipped—can be disabled)

Table 5-2. AT Interrupt Assignments

5.9.4 DMA CHANNELS

The CPU is very adept at moving data. It can transfer data between memory locations, I/O locations, or from memory to I/O and back with equal ease. However, PC designers realized that transferring large amounts of data (one word at a time) through the CPU is a hideous waste of CPU time. After all, the

CPU really isn't processing anything during a data move, just shuttling data from one place to another. If there was a way to "off-load" such redundant tasks from the CPU, data could be moved faster than would be possible with CPU intervention. Direct Memory Access (DMA) is a technique designed to move large amounts of data from memory to an I/O location, or vice versa, without the direct intervention by the CPU. In theory, the DMA controller IC acts as a stand-alone "data processor," leaving the CPU free to handle other tasks. Table 5-3 illustrates the use of DMA channels for current AT systems.

DMA	TRADITIONAL FUNCTION	CURRENT FUNCTION(S)
0	Dynamic RAM refresh	Audio System
1	Unused	Audio System or Parallel Port
2	Floppy-disk controller	Floppy Disk Controller
3	Unused	ECP Parallel Port or Audio System
4	Reserved (used internally)	Reserved (used internally)
5	Unused	Unused
6	Unused	Unused
7	Unused	Unused

Table 5-3. DMA Channel Assignments

5.9.5 I/O AREAS

Both XT and AT computers provide space for I/O (input/output) ports. An I/O port acts very much like a memory address, but it is not for storage. Instead, an I/O port provides the means for a PC to communicate directly with a device—allowing the PC to efficiently pass commands and data between the system and various expansion devices. Each device must be assigned to a unique address (or address range).

I/O assignments are generally made manually by setting jumpers or DIP switches on the expansion device itself, or automatically through the use of Plug-and-Play. As with other system resources, it is vitally important that no two devices use the same I/O port(s) at the same time. If one or more I/O addresses overlap, a hardware conflict will result. Commands meant for one device might be erroneously interpreted by another. Remember that although many expansion devices can be set at a variety of addresses, some devices cannot. Table 5-4 gives an example of some common I/O assignments.

0064H	Keyboard controller, CMD/STAT bytes
0378h-037Fh	LPT1
035F8h-03FFh	COM1
FF00h-FF07h	IDE bus-master register

Table 5-4. Example of I/O Assignments

5.9.6 RECOGNIZING AND DEALING WITH CONFLICTS

Fortunately, conflicts are almost always the result of a PC upgrade gone awry. Thus, a technician can be alerted to the possibility of a system conflict by applying the Last Upgrade rule. The rule consists of three parts:

1. Hardware and/or software has been added to the system recently.

2. The trouble occurred after a piece of hardware and/or software was added to the system.

3. The system was working fine before the hardware and/or software was added.

If all three of these common-sense factors are true, chances are very good that you are faced with a hardware or software conflict. Unlike most other types of PC problems, which tend to be specific to the faulty sub-assembly, conflicts usually manifest themselves as much more general and perplexing problems. The following symptoms are typical of serious hardware or software conflicts:

- The system locks up during initialization.
- The system locks up during a particular application.
- The system locks up when a particular device (e.g., a TWAIN scanner) is used.
- The system locks up randomly or without warning regardless of the application.
- The system might not crash, but the device that was added might not function (even though it seems properly configured). Devices that were in the system previously might still work correctly.
- The system might not crash, but a device or application that was working previously no longer seems to function. The newly added device (and accompanying software) might not work properly.

What makes these problems so generic is that the severity and frequency of a fault, as well as the point at which the fault occurs, depends on a number of factors. The particular devices that are conflicting, the resource(s) that are conflicting among the devices (i.e., IRQs, DMAs, or I/O addresses), and the function being performed by the PC when the conflict manifests itself. Since every PC is equipped and configured a bit differently, it is virtually impossible to predict a conflict's symptoms more precisely.

5.9.7 CONFIRMING AND RESOLVING CONFLICTS

Recognizing the possibility of a conflict is one thing, proving and correcting it is another issue entirely. However, there are some very effective tactics at your disposal. The first rule of conflict resolution is Last In First Out (or LIFO). The LIFO principle basically says that the fastest means of overcoming a conflict problem is to remove the hardware or software that resulted in the conflict. In other words, if you install board X and board Y ceases to function, board X is probably conflicting with the system, so removing board X should restore board Y to normal operation. The same concept holds true for software. If you add a new application to your system, then find that an existing application fails to work properly; the new application is likely at fault. Unfortunately, removing the offending element is not enough. You still have to install the new device or software in such a way it will no longer conflict in the system.

5.10 TROUBLESHOOTING DISK PROBLEMS

The mechanical nature of drives makes them prone to a host of ills. The most common problems are; a diskette cannot be read; the drive refuses to read or write; the drive causes random bad reads/writes; the

drive is noisy; or the drive emits grinding sounds. Additionally, when the drive shows "phantom directories" and you change the disk, the drive does not recognize the change.

5.10.1 A DISKETTE CANNOT BE READ

Pop a diskette in the drive and try to read it, and you get a "Data error reading drive x," or "Sector not found reading drive x," or perhaps the dreaded "General failure reading drive x" message. These messages have a way of getting you fired up first thing in the morning, particularly if the diskette contains the only copy of your data.

If this should happen to you, don't panic. Follow these suggested recovery techniques:

- Press "r" for Retry. Sometimes it will work. Ignore the painful grinding sounds.
- Remove and replace the floppy. Sometimes 3.5-inch diskettes are unreadable until you take them out and put them back in. The hub centering is fairly critical.
- Take the floppy out and try it in another drive. There is the chance that the drive is bad or the wrong kind.

A related question - does the drive read other diskettes? If so, either the disk's head could be misaligned or the diskette could have been written by a different disk drive and the other disk's head was misaligned. Try to find the drive that created the disk.

5.10.2 DRIVE REFUSES TO FUNCTION

When the drive will not read or write properly, there are several possible causes (assuming that the drive worked all right before and no changes have been made to any of the computer's parameters that might cause problems or conflicts).

Did you see a "601" or "Floppy drive controller failure error" message on the screen when the system booted up? A 601 message is the IBM Power-On Self-Test (POST) error message that indicates drive A: did not respond. It means that: (a) SETUP (on an AT-type system) or motherboard DIP switches (on type system) are configured wrong. Run SETUP to verify that the system is configured properly; (b) The controller has failed; (c) Drive A: has failed; or (d) The cable has failed.

- If there was not a POST error, try other diskettes. If only one diskette gives the drive problems, the problem, more than likely, lies in the diskette.
- Clean the disk heads. It's easy and only takes a minute.
- Try to format a diskette. If you could format a diskette all right but that diskette is unreadable by other drives, your drive head is probably mis-aligned. If it will not format a diskette, go to the next step.
- Re-seat the controller board, and the cables. It cannot hurt to check that the cable twist, terminators, and drive select jumper are correct. Do not change anything if it was working previously. Only ensure you have good connections.

- Run a disk tester like Test-Drive to check speed, alignment, hub centering, and the like.

- Lastly, if you get to this point, swap the relevant components (such as the controller, cable and drive).

Only swap one component at a time; and when swapping a component does not solve the problem, replace it. If the problem goes away after you have swapped five components, you haven't really pinpointed the source of trouble. It could have been any of the five items you've replaced. Once again, don't overlook the lowly cable. Cables can get nicked when installing boards, replacing drives, or just removing the cover. How bad the end result is depends on which line became nicked.

5.11 HARD DISK TOOLS

5.11.1 CHECK DISK

Check Disk is a holdover from the DOS days. Check Disk checks the status of a disk and displays a status report. Check Disk can also fix disk errors. The status report shows logical errors found in the MS-DOS filing system, which consists of the file allocation table and directories. (Chkdsk does not verify that the information in your files can be accurately read.) If errors exist on the disk, Chkdsk alerts you with a message. You should use Chkdsk on each disk periodically to check for errors.

Never use Chkdsk when files are currently open. Chkdsk is designed for use when the files on the disk are in an unchanging state. When a file is open, it is probably changing, and MS-DOS will update the file allocation table and the directory structure to reflect changes. Such updates are not always made immediately, and updates to the file allocation table and the directories occur at different times. If you run Chkdsk when files are open on the disk, it interprets the differences between the directory structure and the file allocation tables as errors.

If you want to check the disk in drive A: and have MS-DOS fix any errors encountered, type the following command: Chkdsk a: /f. Chkdsk pauses and displays messages if it encounters errors. Then Chkdsk may prompt you to specify how you want MS-DOS to correct the errors. Chkdsk finishes by displaying a report showing the status of the disk.

5.11.2 SCAN DISK

CheckDisk was replaced by ScanDisk, which was designed for use with Windows 95/98. ScanDisk is a full-featured disk analysis and repair program. ScanDisk runs automatically when you start Windows 95/98 Setup. After Windows 95/98 is installed, you can use ScanDisk on both uncompressed and compressed drives.

ScanDisk checks and fixes problems in the following areas on hard disk drives, floppy disk drives, RAM drives, and memory cards:

- File allocation table (FAT)

- Long filenames

- File system structure (lost clusters, cross-linked files)
- Directory tree structure
- Physical surface of the drive (bad sectors)
- DriveSpace or DoubleSpace volume header, volume file structure, compression structure, and volume signatures

When using ScanDisk, don't run just once. Run several times until you have no errors found two or three times in a row. The reason is that often ScanDisk will find some errors and continue on, but more errors are unburied once completed. Therefore running several times will help weed out all the errors.

5.11.3 DEFRAG

Operating systems like DOS and Windows 95/98 segregate drive space into groups of sectors called clusters. Clusters are used on an "as found" basis, so it is possible for the clusters that compose a file to be scattered across a drive. This forces the drive to work harder (and take longer) to read or write the complete file because a lot of time is wasted moving around the drive. The Defrag utility allows related file clusters to be relocated together.

If you are running Windows 95/98 or Windows 2000, click Start, Programs, Accessories, System tools, and Disk Defragmenter. Select the drive to be tested and start the cycle. Defrag will relocate every file on the disk so that all their clusters are positioned together (contiguous). Windows NT 4.0 does not have disk defragmentation software included, however, you can get third party software.

You can run Defrag any time, but you do not need to run Defrag until disk is more than 10% fragmented. Disk utilities like ScanDisk and Defrag are great tools, and a necessity, however, running them in excess (like every day, or even every week) can be hard on the mechanical mechanisms of hard drives. These utilities spin the drives a lot, therefore, lead to wearing out drives faster.

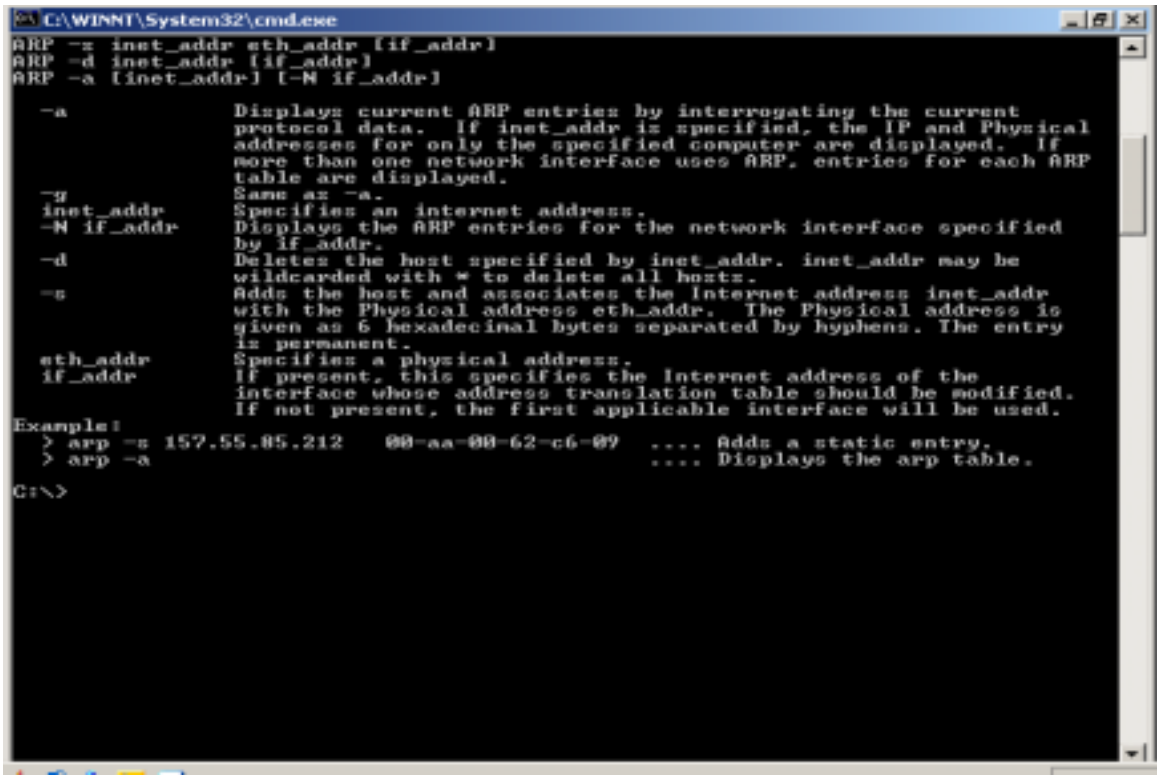
5.12 TROUBLESHOOTING TCP/IP CONNECTIONS

There are several troubleshooting utilities included within Windows 98/NT4/2000 that enable you to determine problems with TCP/IP connections:

- ARP
- Nbtstat
- Netstat
- Ping
- Route
- Tracert

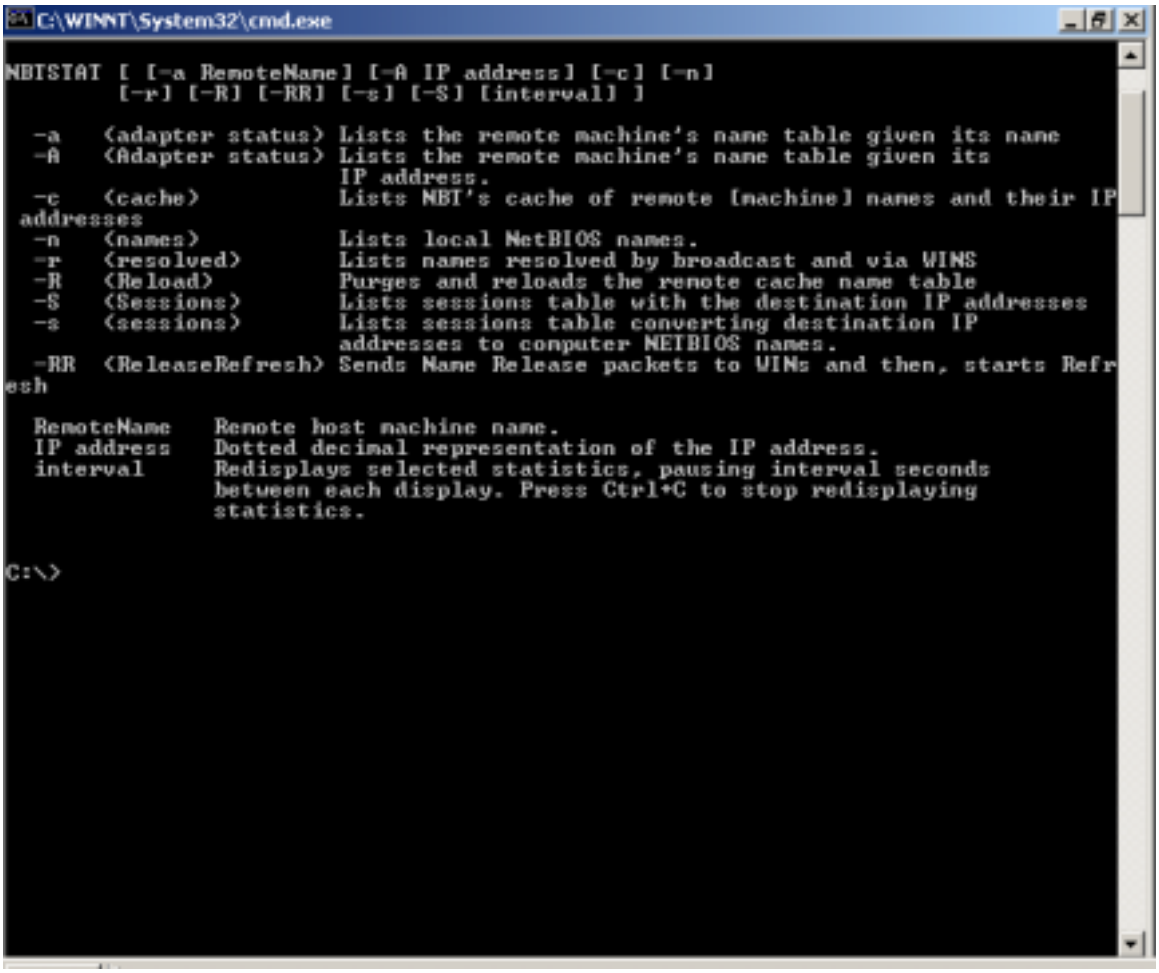
5.12.1 ADDRESS RESOLUTION PROTOCOL (ARP)

This diagnostic command utility displays information regarding the Address Resolution Protocol (ARP) IP-to-Ethernet or IP-to-Token-Ring address translation tables.



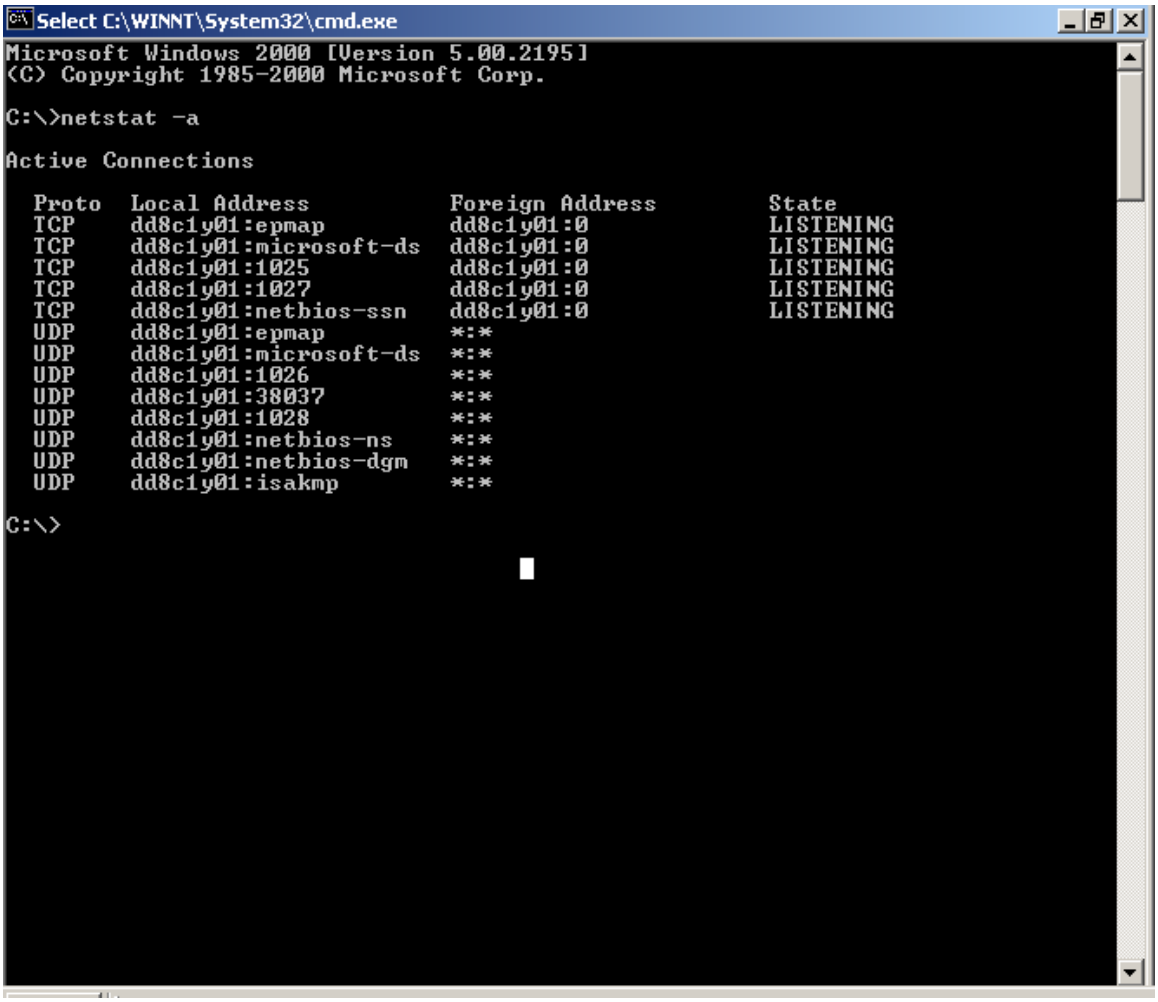
5.12.2 NBTSTAT

This diagnostic command utility displays information regarding the node IP address, scope ID, and current TCP/IP connections using NetBios.



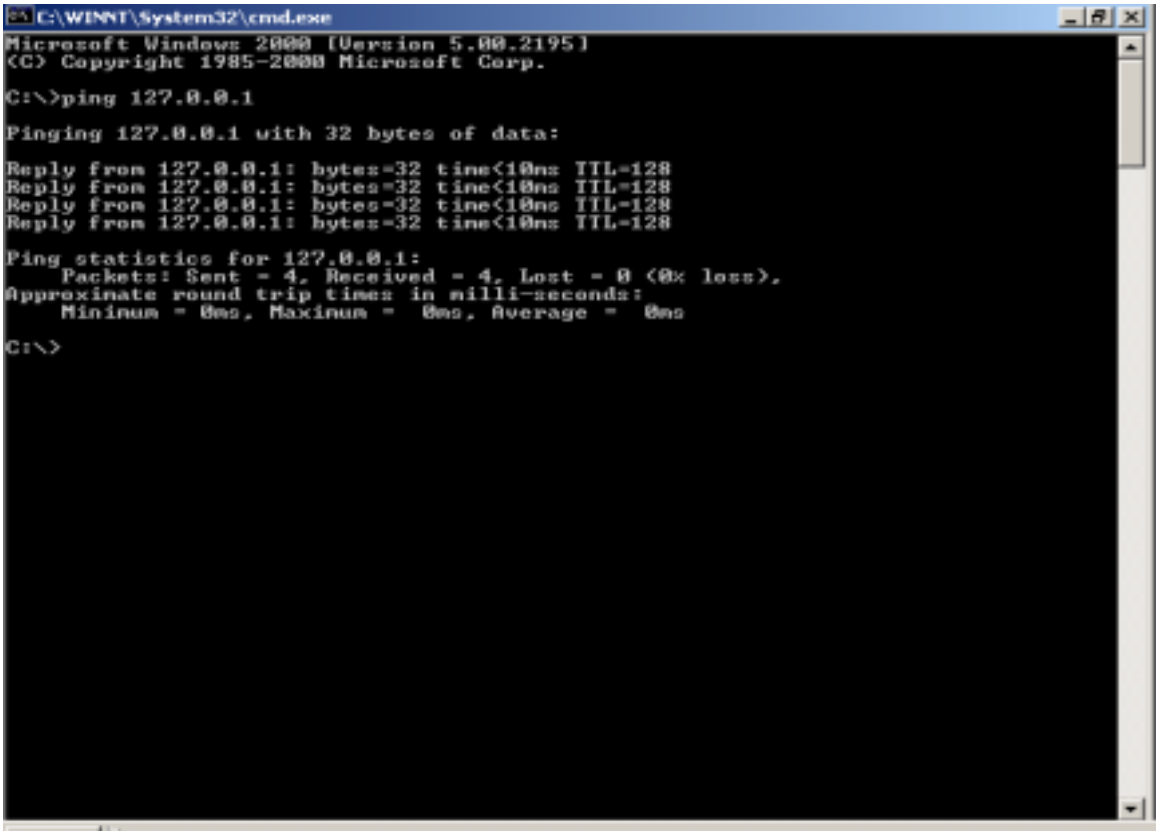
5.12.3 NETSTAT

This diagnostic command utility displays information regarding the designated protocol(s) and current network connections.



5.12.4 PING

This diagnostic command utility enables you to verify that a connection can be established with a particular host. Ping can also be used to test your Network Interface Card by doing an internal loop back using the IP 127.0.0.1.



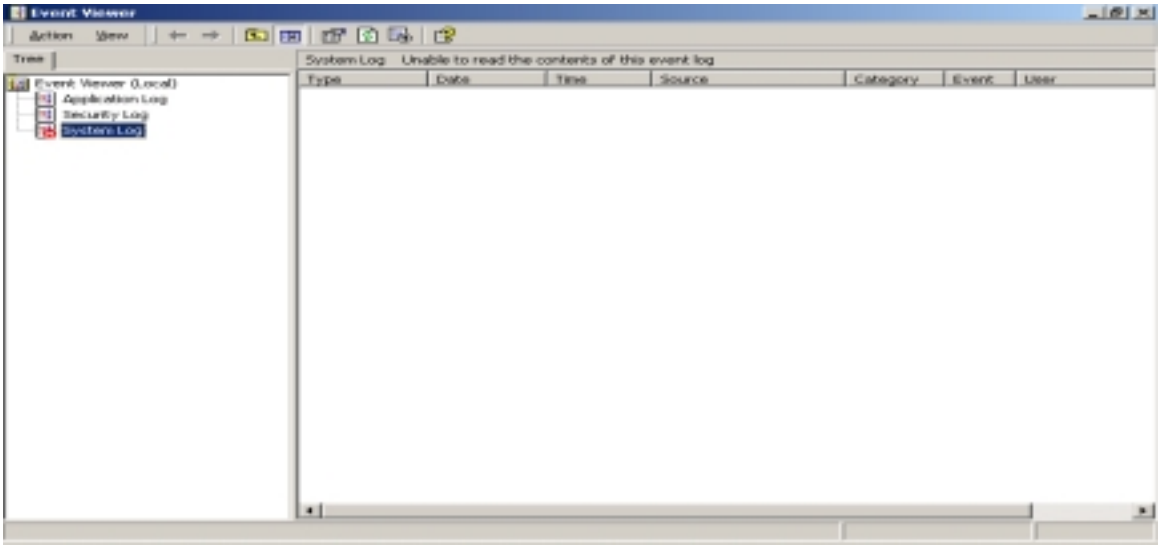
5.13 WINDOWS 2000 TROUBLESHOOTING

5.13.1 WINDOWS 2000 HAS SEVERAL TROUBLESHOOTING TOOLS:

- Event Viewer
- Device Manager
- Add/Remove Hardware
- Window 2000 Troubleshooter
- Disk Management
- Check Disk

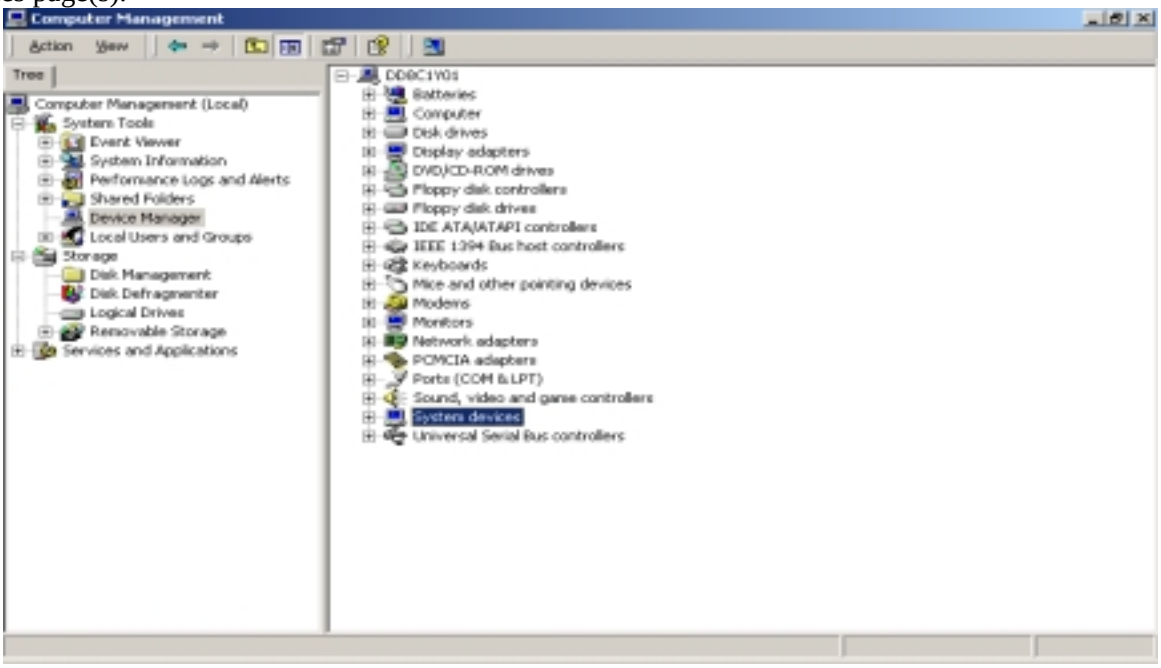
5.13.2 EVENT VIEWER

The Event viewer is one of the first places to look when problems arise. There are three logs in an Event viewer: Application Log, Security Log and System Log. Device driver and service failures will be recorded in the System log. Failed log-on and success log-on will be recorded in the Security Log. The Application Log will record all application errors.

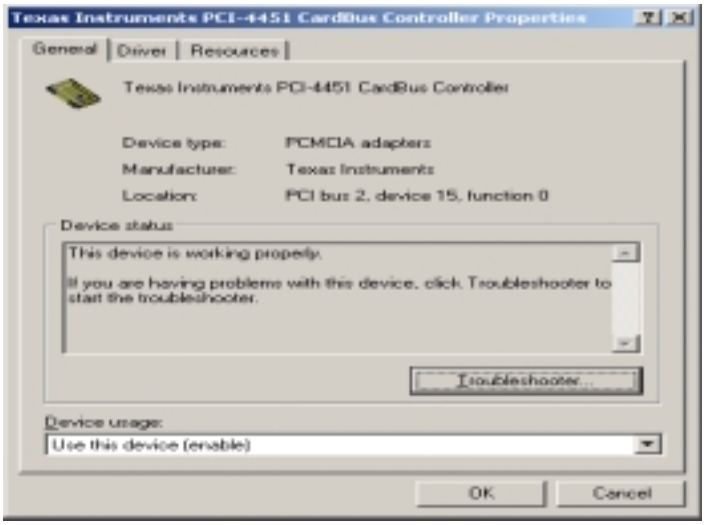


5.13.3 DEVICE MANAGER

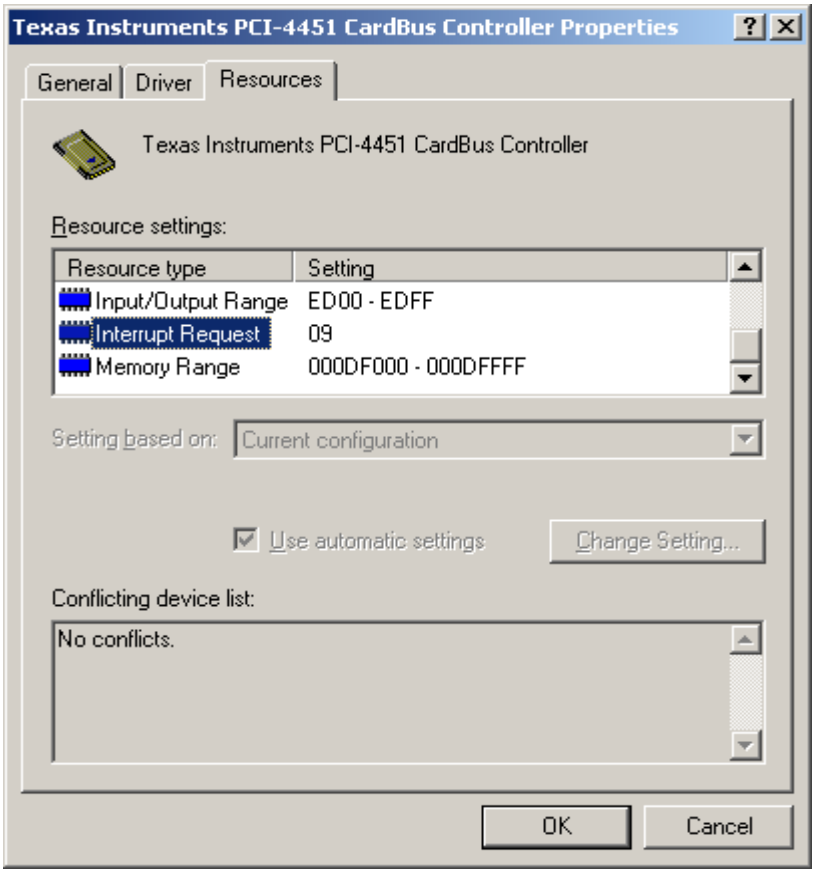
Device Manager lets you quickly identify failing devices. When a device failure is detected, device Manager will automatically expand the device category and identify the failing device with an exclamation point (!). You can get more information about the failing device by displaying the devices' properties page(s).



The General tab will give you a summary description of the error. You can click on Troubleshooter to launch the Windows 2000 Troubleshooter.



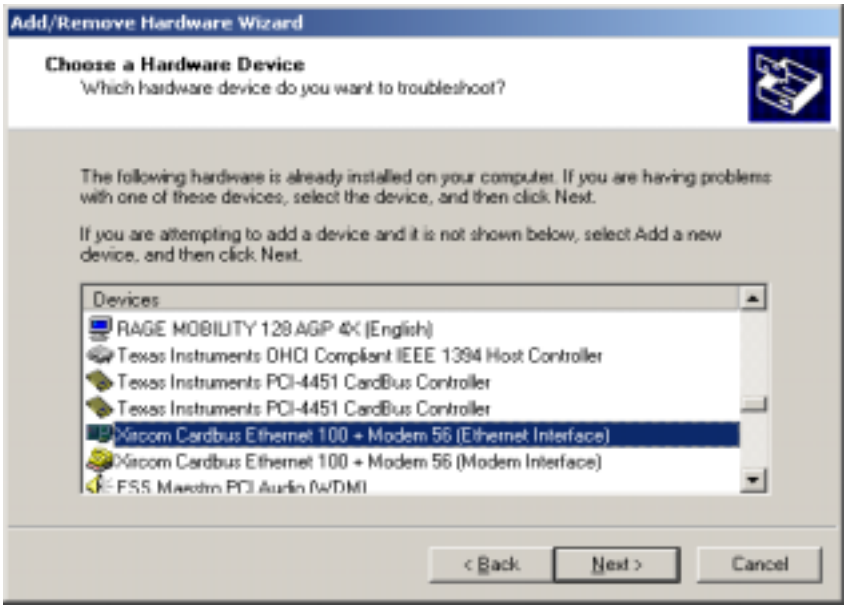
Another place to check is the Resource tab. Since the device isn't working, you will likely see a message like the one in the previous figure telling you that the device isn't using any resources. The problem may be that the device is misconfigured, preventing the operating system form being able to initialize the device properly. Click on Set Configuration Manually to change the device configuration.



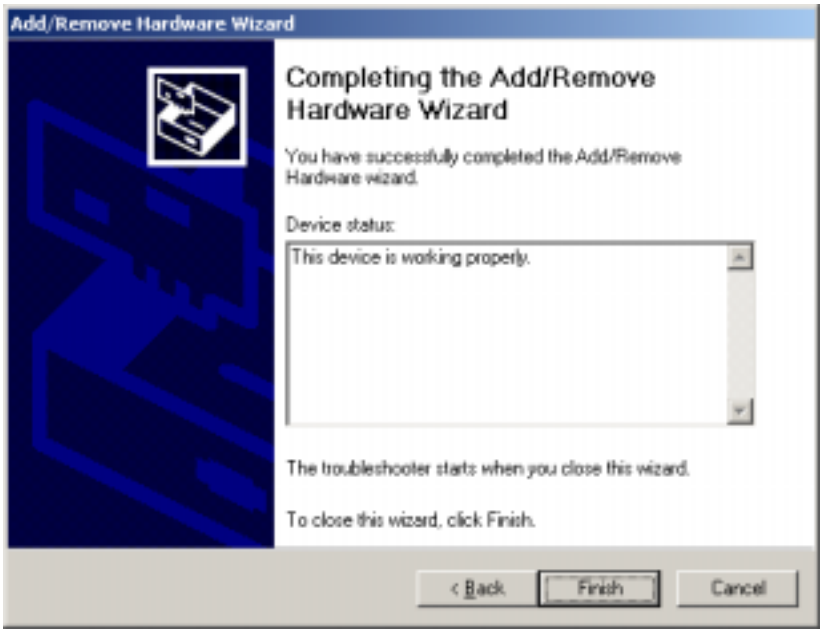
You see a list of resources required by the device and their current settings. The Change Setting button will prompt you with available setting. The lower pane on this page will warn you of any detected conflicts.

5.13.4 ADD/REMOVE HARDWARE

If the Add/Remove Hardware Wizard doesn't detect any new Plug and Play devices on your system, it will display a list of devices for troubleshooting. To troubleshoot a device, select it and click on next.

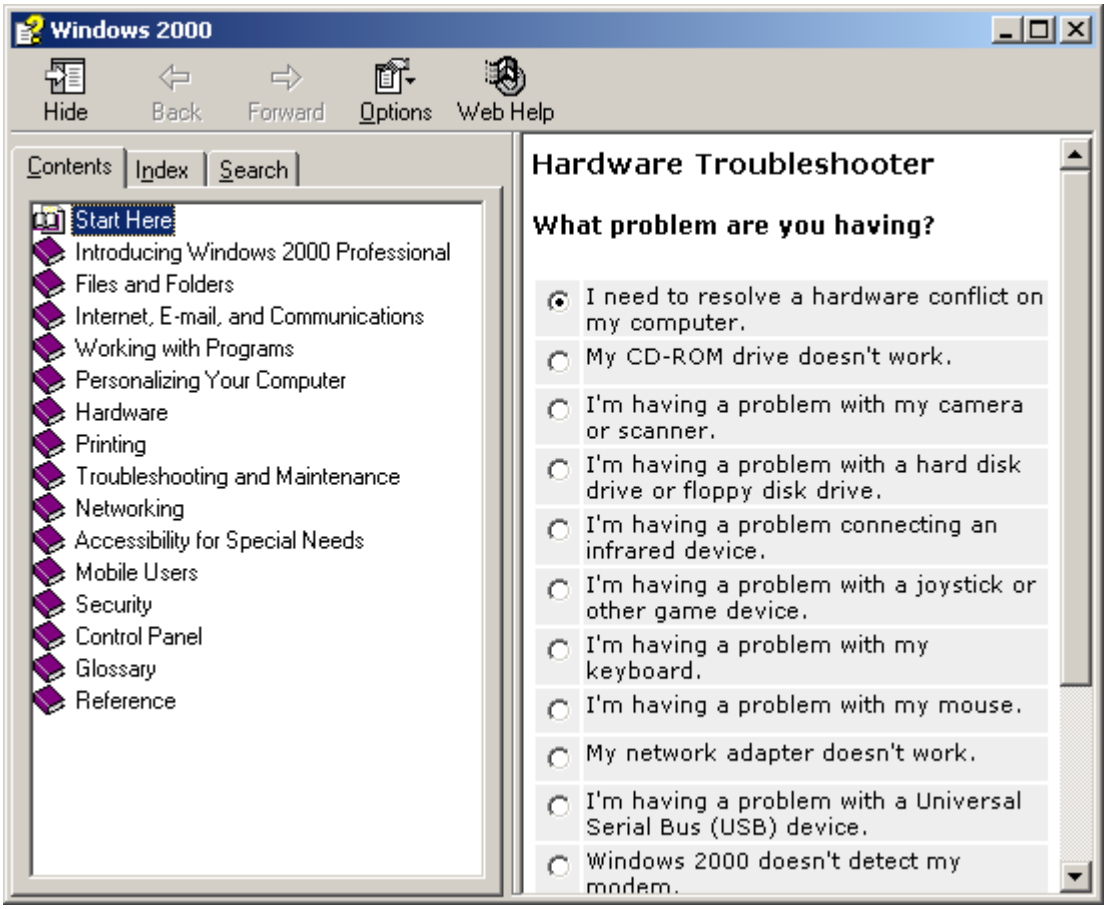


Add/Remove Hardware will usually report the same error as the Device Manager Snap-in. Click on Finish to exit. Typically, you will be taken to Windows 2000 Troubleshooter when you click on Finish.



5.13.5 Windows 2000 Troubleshooter

In Windows 2000 Troubleshooter in the context of both the Device Manager, Snap-in and the Add/Remove Hardware utility. When Troubleshooter is accessed from either utility to diagnose a failing device, information about the error code will be displayed.



Most error entries also include a set of suggested quick fixes, which will correct many common problems.

Of course, there are going to be problems with hardware devices that are not recognized by either the Device Manger Snap-in or the Add/Remove Hardware utility. That doesn't necessarily mean the operating system doesn't provide you some level of help in troubleshooting.

Windows 2000 Troubleshooter can be used to help you isolate hardware failures. When launched for a "non-failing" device, you will be taken to the electronic equivalent of troubleshooting flowcharts. You will be presented with a series of questions, typically ending with suggestions for fixing the problems.

5.13.6 CHECKDISK

- Running CheckDisk can help you identify when drives are starting to degrade, preventing you from having to find out after you have a hard failure.

- Intermittent disk errors are going to occur and can come from any number of sources. If they become a common occurrence on a drive, however, it is often an indication that the drive media, or internal disk, are degrading. The only corrective measure is replacing the drive.

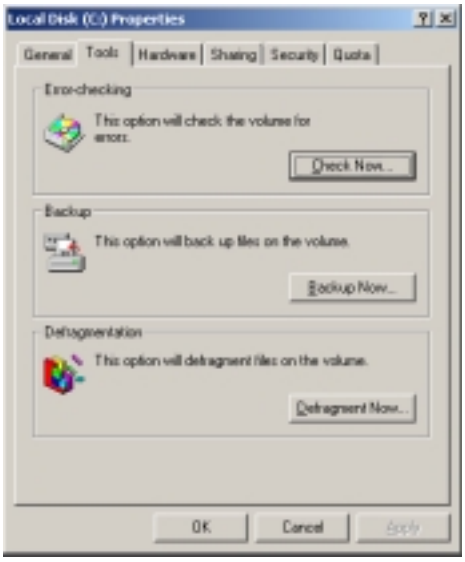
- To avoid degradation of a hard drive use CheckDisk utility on a monthly basis to keep hard healthy.

- CheckDisk checks for two basic types of errors: system and sector errors

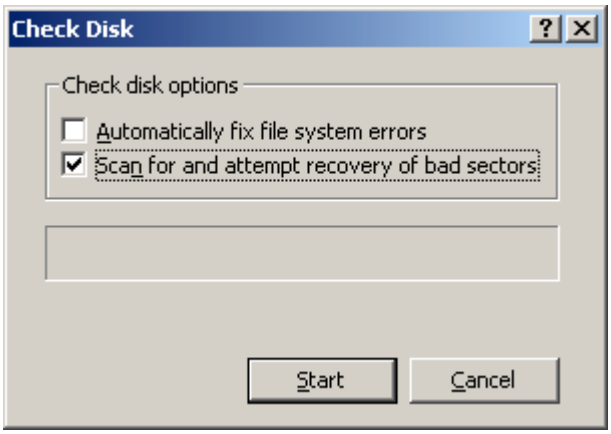
    - System errors: System errors are items such as cross-linked files or invalid filenames. CheckDisk can detect and repair errors of this type, though repair sometimes means deleting the affected file.

    - Sector errors: CheckDisk can also look for damaged sectors by scanning the entire volume. It will attempt to recover any damaged sectors that it locates.

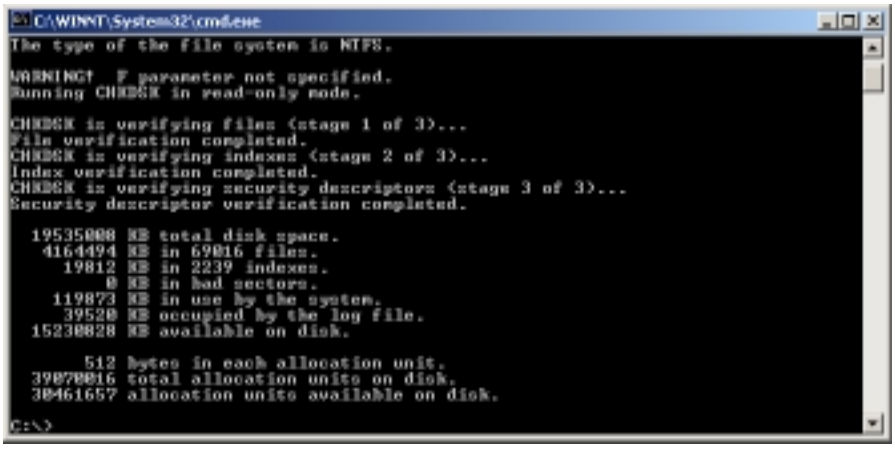
- CheckDisk supports FAT16/32, and NTFS File System volumes. CheckDisk can be launch from the volume or logical drive's properties pages. Display the Tools properties page and click on Check Now to launch CheckDisk.

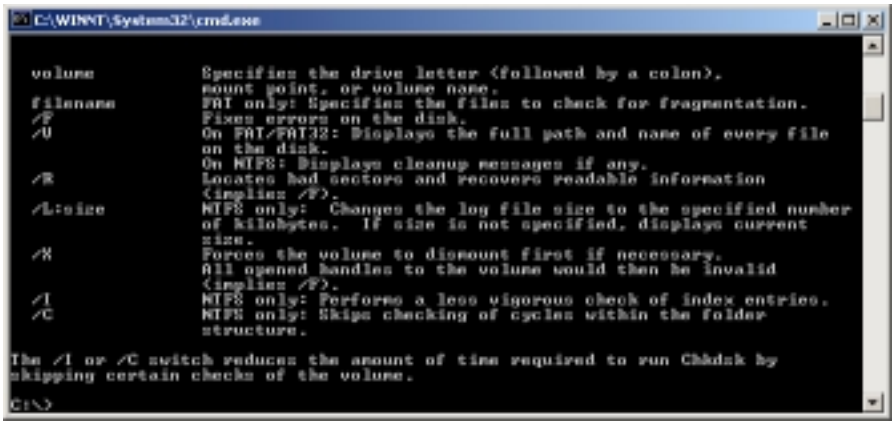


Select the options you want CheckDisk to use and click on Start to begin checking the disk. If you do not select to have CheckDisk fix errors automatically, each time CheckDisk finds an error, you will be prompted to determine what action should be taken.



5.13.6.1 A COMMAND-LINE VERSION OF CHECKDISK, NAMED CHKDSK.EXE, IS ALSO AVAILABLE.

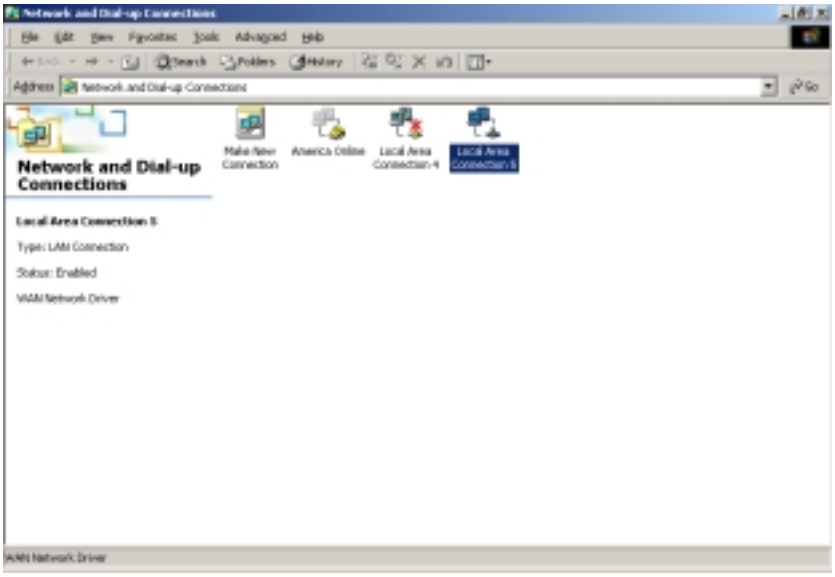




5.14 TROUBLESHOOTING NETWORK CONNECTIVITY WINDOWS 2000

5.14.1 CONNECTION TROUBLESHOOTING

The first indication that you are having a connection problem is that you cannot access network resources.



You can check your network connection in the Network and Dial_up Connections pane. You will see a red X displayed in the network icon if you lose your network connection. You can also check the network icon on your desktop toolbar; it will also display a red X.

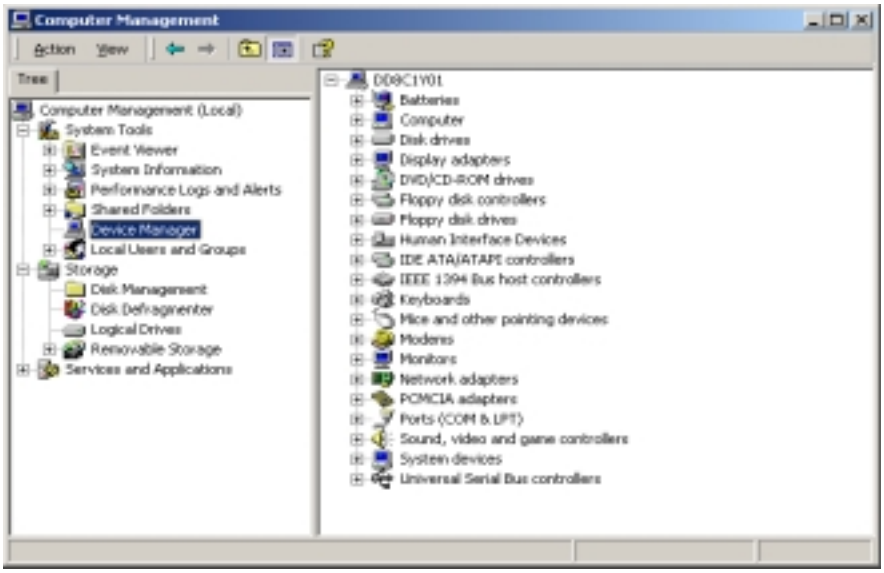
Another place to check is your connection Status. Launch Network and Dail-up Connections, right-click on your LAN connection, and run **Status**.

Check the Status field for your connection status. Also, if your computer was unable to connect to the network when it started, you will see a count under Sent but a value of 0 under Received.

5.14.2 NETWORK ADAPTERS AND DEVICE DRIVERS

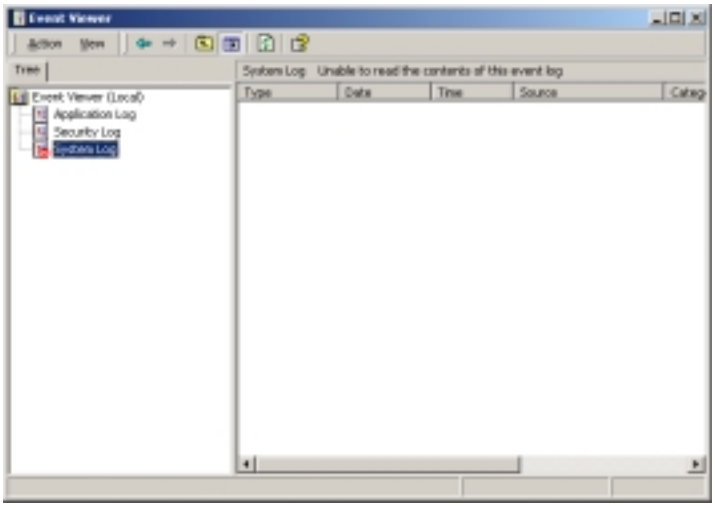
One of the most common problems with network connection is the failure of the adapter or its device drivers.

Normally Network adapter failures will occur during Startup. One of the first places to check in Device Management is the Computer Management tool.

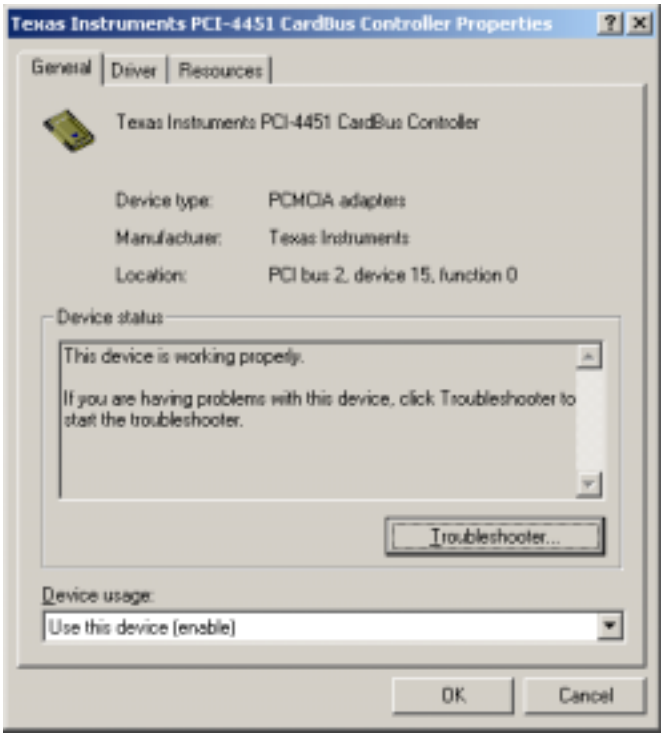


When an adapter fails during Startup, you will see an exclamation (!) in Device Management, indicating an error, or the device will be missing. This is common when Plug and Play devices fail. If Windows 2000 cannot detect the device, it assumes that it has been removed.

You can also find network adapter failures in the Event Viewer System Log.



If a device failure is indicated, you can display the device properties for more information. This displays a brief description of the error. Click on Troubleshooter to launch the Windows 2000 Troubleshooter (Windows 2000 Help).



The Troubleshooter will usually have a more complete description of the error and will often provide some quick solutions for you to try.

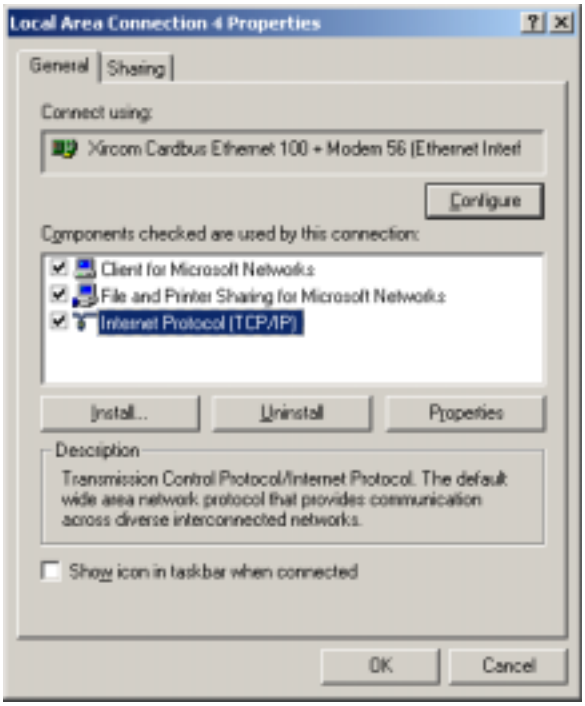
Sometimes an adapter will fail due to a transient error. One of the first things you should try when you have a failing adapter is to do a cold reboot of the system. Shut down the system, shut off power, then turn the power back on and restart the system. This will force all of the system hardware to reinitialize and may bring your network adapter back online.

Sometimes the problem is that the adapter wasn't secured properly when it was installed and has worked its way out of its slot. In this case, shut the system down, then shut the power off. Remove and then reinsert the network adapter, then restore system power to see if the adapter starts working again.

If neither of these solutions works, you will probably have to replace the adapter.

5.14.3 DRIVER FAILURE

Sometimes the only indication of driver failure is that you have lost your network connection. The network adapter may appear to be working fine however; the driver may have become corrupt. When in doubt simply reapply the device driver files and restart the computer. If this does not solve the problem reapply network protocols in the Network and Dial-up Connections properties Pane. In most case this will solve the problem, if the problem persist proceed to the Windows 2000 troubleshooting assistance.



5.15 LAST RESORT

Sometimes, there is just no way around it. Your only recourse is to wipe the disk clean and start over. You can start with a new format. You cannot format a hard disk by using the Windows 95 Setup. The hard disk must be formatted before you can run the Windows 95 Setup.

- Format - The DOS Format command creates the DOS boot record, FATs, and Root Directory. It does not actually touch the MBR or the user data area. Theoretically, format does not destroy or overwrite data, making formatted disks recoverable.

Your format could detect bad areas. These bad areas may be either hard or soft errors. In the case of hard errors, the area is unreadable and the data is lost. The next low-level format should mark the sectors as bad and unusable. A soft error is where the data has faded to the point that it cannot be read. In this case the Format program will annotate not to use it again.

- Fdisk - The DOS Fdisk command creates the actual partitions and Master Boot Record (MBR). Once a disk partition is deleted using Fdisk, the data is not recoverable.

5.16 QUICK FIXES

Many times you can solve a user problems with little or no effort by using the quick fix list:

- Have the user re-start the machine. This will re-install all component, drivers' configuration and reload all applications.
- Check the connectors
- Check the power switches
- Check system resources
- Check system memory
- Check Device Manager to see if there are conflict with newly installed hardware
- Check for system compatibility with newly installed software

5.17 TROUBLESHOOTING TIPS

- Ensure the user is not causing the problem.

  The user doing something wrong versus a real system error causes many problems. Have the user re-create the problem and ensure it is not user error.

- Ensure all devices are plugged in and turned on, and is the wall outlet supplying power?

  Many times cable connectors slide out of place it they are not securely attached. They can be knocked loose accidentally by the user or cleaning staff. Check to see that the cables are attached at both ends and secured, using the restraint devices installed.

- Remove the case and reseat the boards.

  After you have checked all cables connector, look for loose connections or dust in the connections between the daughter boards and the motherboard that can cause PCs to malfunctions.

  Boards can appear to be bad because a socketed chip has worked loose. You can bring these boards back to life simply by reseating these chips. To reseat a socketed chip, gently press the chip back into its socket while supporting the backside of the board.

- Check to see that the problem is not caused by software.

  Sometimes software can cause a machine to crash. Check to see what software was most recently loaded on the machine. Check vendors guide for software compatibility with OS and hardware. In some case there may be a service patch that is necessary to run the application, which can be obtained from the vendors web site.

- Are the correct device drivers being used?

  Many times wrong device drivers are loaded. Also drivers might require an update if loading a new Operating Systems. You can check to see if the right drives are loaded in the device manager.

- Run diagnostic program

  Most PCs comes with built-in diagnostic programs. To run the diagnostic simply run help from the start menu. In the help window type the problem that you have to activate the diagnostic program.

5.18 RESOURCES

Microsoft Windows 98 Resource Kit, Microsoft Press
Microsoft Windows 95 Resource Kit, Microsoft Press
Microsoft Windows 2000 Professional Resource Kit, Microsoft Press
Troubleshooting, Maintaining, and Repairing PCs, Stephen J. Bigelow, McGraw Hill

5.19 SUMMARY

Certainly, we know that things do not always go as planned. We know that we will not be able to solve every problem we encounter. What we wanted to show here was where to start looking when things are not going quite as planned. As you step through troubleshooting each problem, you should be able to isolate the problem area.

5.20 REVIEW QUESTIONS

1. (5.3.1) The biggest barrier when troubleshooting is?

a. lacking the knowledge or expertise to resolve the problem
b. not having the necessary tool(s) available when you need them
c. isolating the true problem from the vast range of possibilities
d. dealing with all the differing types of software and hardware

2. (5.4) The four basic troubleshooting steps are to?

a. assess, define, isolate, and resolve
b. assess, define, repair, and document
c. define, isolate, repair, and document
d. define, isolate, resolve, and document

3. (5.4) More than ___ percent of problems are software and hardware related?
a. 70
b. 75
c. 80
d. 85

4. (5.4) Under what troubleshooting step would you re-create a problem to determine if there is a quick fix?

a. Define
b. Isolate
c. Resolve
d. Document

5. (5.5.1) All of the following are hardware troubleshooting tools except?

a. screwdriver
b. nut driver
c. torx driver
d. ampmeter

6. (5.5.2) All of the following are software troubleshooting tools except?

a. original component drivers
b. copy of applications software
c. image cast
d. partition magic

7. (5.9.1) Hardware conflicts in PCs can be attributed to the use of?

a. devices that use different resources
b. an open architecture
c. compatible software
d. infinite system resources

8. (5.9.2) The three system resources available to help you are?

a. DMA channels, I/O areas, and interrupts
b. DMS channels, I/O areas, and interrupts
c. DMA channels, I/O areas, and BIOS
d. DMS channels I/O areas, and BIOS

9. (5.9.3) Interrupts are used to?

a. transfer data between memory locations
b. provide a means for a PC to communicate with a device
c. demand attention from the CPU
d. off-load redundant tasks from the CPU

10. (5.9.3) Interrupts can be triggered by?

a. transferring large amounts of data through the CPU
b. overlapping addresses
c. successful PC upgrades
d. the output signal generated by a PIC

11. (5.9.3) An interrupt is invoked by?

a. manually setting jumpers on expansion devices
b. asserting a logic level on one of the IRQ lines
c. overlapping addresses
d. commands meant for one device being erroneously interpreted by another

12. (5.9.6) All of the following are symptoms of a serious hardware/software conflicts except?

a. An application that was working previously is no longer functioning
b. The system locks up during a particular application
c. A device that was added does not function
d. The system locks up after initialization

13. (5.9.7) The first rule of conflict resolution is?

a. last in first out
b. first in first out
c. first in last out
d. last in last out

14. (5.9.4) Direct Memory Access is a technique that is designed to?

a. access/update data stored in an I/O location
b. instantly recall archived data from an I/O location
c. move large amounts of data to/from an I/O location
d. store large amounts of data in an I/O location